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We present a nodal Discontinuous Galerkin Finite Element Method (DG-FEM) solution based on a new set of high-order Boussinesq-type equations for solving water-wave problems in complex geometries in 3D, [1, 2]. A nodal DG-FEM is used for the spatial discretization to solve the Boussinesq equations in complex and curvilinear geometries which amends the application range of previous numerical models that have been based on structured grids.

The new Boussinesq method provides the basis for the accurate description of fully nonlinear and dispersive water waves in both shallow and deep waters under the assumption of a potential flow. To demonstrate the applicability of the model both linear and nonlinear test cases are considered where the water waves interact with bottom-mounted fully reflecting structures.

It is shown that by simple symmetry considerations combined with a mirror principle it is possible to impose weak slip boundary conditions for both structured and general curvilinear wall boundaries while maintaining the accuracy of the scheme. As is standard for current high-order Boussinesq-type models, arbitrary waves can be generated and absorbed in the interior of the computational domain using a highly flexible relaxation technique applied on the free surface variables.

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